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Similarly, $\cos \rho' = (\sin R - \sin r) / \sin(R-r)$. $\therefore \rho = \rho'$.
 These equations reduce to $\tan^2 \frac{1}{2} \rho = \tan^2 \frac{1}{2} \rho' = \tan^2 \frac{1}{2} R \tan^2 \frac{1}{2} r$.

Professor Philbrick gave a solution of this problem at the time it was published but it did not fill the requirements because it was not a pure spherical geometry solution.

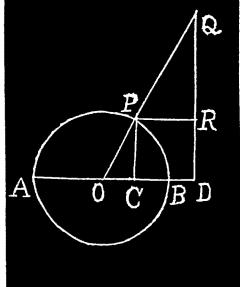
290. Proposed by J. J. QUINN, Scottdale, Pa.

(a) Suppose a circle described around the origin. Then at the end of a uniformly revolving radius r , a line equal to the diameter is pivoted. Find the equation of the locus of its extremity, if for every unit of angle its projection on the X axis is a constant linear unit, being the same part of the diameter as the angle is of π radians.

(b) Show how it can be applied to the trisection or multisection of an angle.

Solution by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

(a) Let angle $POB = \theta$. Then CD , the projection of $PQ = 2r$ on AB , is $r \theta/90$. $OD = x = r \cos \theta + r \theta/90$.



$$DQ = y = r \sin \theta + r \sqrt{[4 - (\theta/90)^2]}.$$

$$r^2 = x^2 + y^2 = 5r^2 + 2r^2 \cos \theta (0/90)$$

$+2r^2 \sin \theta \sqrt{4 - (\theta/90)^2}$ is the polar equation sought.

(b) Let $m\phi$ be the angle to be multisected.

$m\phi/m = \phi$. Lay off $OD = x = r\cos \phi + r\phi/90$.

Then erect $DQ = y = r \sin \phi + r \sqrt{[4 - (\phi/90)^2]}$ perpendicular to OD at D . From Q as center, with radius equal to $2r$ describe an arc cutting the circumference of the given circle at P .

Draw PO ; then $\angle POD = \phi$.

300. Proposed by J. J. QUINN, Ph. D., Scottdale, Pa.

Trisect an angle by means of a tractrix.

Solution by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philadelphia, Pa.

The length of the tangent between the axis of abscissas and the point of tangency is constant.

Let a = length of this tangent, y = an ordinate opposite angle θ , z = an ordinate opposite angle ϕ . Also let $\theta = 3\phi$.

$$\therefore y = a \sin \theta = 3a \sin \phi - 4a \sin^3 \phi, z = a \sin \phi.$$

$$\therefore y/z = 3 - 4\sin^2 \phi \text{ or } \sin \phi = \frac{1}{2} \sqrt{[(3z-y)/z]}.$$

$$\therefore z^2/a^2 = \frac{3z-y}{4z} \text{ or } y = \frac{(3a^2 - 4z^2)z}{a^2}.$$

Let $PD = z$, $PCD = \angle \phi$. Construct $QB = y = \frac{(3a^2 - 4x^2)z}{a^2}$.

Let $QAB = \theta$ where $PC = QA = a$. Then $\theta = 3\phi$.

∴ Parallel to PC draw AR , then $\angle RAB = \angle QAB$.

$PD=z$ cannot be greater than $\frac{1}{2}a$, then $y=a$, $\theta=\frac{1}{2}\pi$, $\phi=\frac{1}{8}\pi$.